Myr ROTARY VISCOMETER VP 1000 RM

VISCOTECH HISPANIA S.L.

Viscotech Hispania S.L. would like to thank you for the purchase of this equipment and for your confidence in choosing our company.

We are committed to offer you the best and most reliable service.

Don’t hesitate to contact your local dealer for any question related to this viscometer.

Your Viscotech Hispania S.L. team.

User manual

(Stand 1.06 - 09/13)

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1 General information

1.1 Introduction

The VP 1000 RM viscometer of the MYR Group is a portable viscometer for quick, flexible, comparative viscosity measurements of a wide range of products.

The VP 1000 RM is not a hand held viscometer. The idea of portability is here based in the light weight of the instrument (1, 8 kg) that permits transportation very easily. The instrument is ready to use; just unpack, set and press a button!

Viscometer VP 1000 RM is battery operated and work at a fixed speed 62,5 rpm. Viscosity readings are delivered in two different units: milli-Pascal seconds (mPas) and deciPascal seconds (dPas) (see conversion information in page 16 of this User Manual)

Measuring principle is based on a rotor immersed in the fluid to be tested and rotating at a constant speed; fluid's resistance to the rotation is measured to obtain direct readings of viscosity in mPas and dPas.

Each Rotor included in basic delivery has a different measuring range. Those viscosity values (measuring range) are only valid if measuring vessel/ Cup no. 3 is used to obtain viscosity readings.

It is also possible to use any available vessel. In this case viscosity results will be only comparative.

The most outstanding feature of the portable viscometers VP 1000 RM is their user-friendliness. This characteristic makes them an ideal tool to carry out measurements in the own premises during the manufacturing process for batch control, for QC check or in laboratories/research centres whenever quick and reliable viscosity readings are needed.

1.2 Intended use

The VP 1000 RM viscometer has been developed specifically to fulfil viscosity readings in all kinds of fluids. Only skilled or specially trained personnel must operate the viscometer.

Everyone who works with the viscometer VP 1000 RM must strictly follow the security precautions and observe the safety rules of the laboratory.

It is not allowed to operate the viscometer for any other purpose as the one described in this chapter. No right to claim warranty will be granted if any of the above norms are disregarded.

1.3 Security symbols

Installation and operation of the VP 1000 RM viscometer are user-friendly and very easy if instructions of this manual are strictly followed.

Be aware that any use of this equipment out of the scope described by the manufacturer may compromise the security of the operator.

Besides this and in order to stress the points that may represent any risk both for the operator and the viscometer itself, this manual uses following symbols and messages:

DANGER

Wherever this symbol, along with the message DANGER, appears in this manual, it indicates a potential personal injury hazard or damage on the viscometer. For your security, strictly observe instructions provided.

CAUTION

Wherever this symbol, along with the message CAUTION, appears in this manual, it indicates that damages on the viscometer may occur if instructions are not observed.

For the proper operation of the equipment, instructions must be strictly observed.

INFORMATION

This symbol refers to specific details of the viscometer which must be specially considered because of their relevance.

Apart from the instructions contained in this manual, everyone who operates the portable viscometer VP 1000 RM is obliged to know and observe the security and hygienic measures of the laboratory where this device is operated.

Everyone who should operate and set up the viscometer must have completely read and understood these instructions before starting the operations.

1.4 Safety notes

Operator security may be at risk if instructions of this manual are not observed.

Please observe the following general precautions during operation of this instrument. Failure to comply with these precautions violates safety standards and the intended use of the instrument. Viscotech Hispania, S.L. is not liable for misuse of the instrument and failure to comply with basic safety requirements.

Battery operated

The viscometer works with batteries. It is strictly forbidden to remove the instrument hood during operation. Component changes and settings must only be fulfilled by specialized personnel. Use only original spare parts when changing any component. Battery replacement must be carried out after switching off the unit and removing the Rotor from the shaft.

Danger in explosive environment

The instrument must not be operated in the presence of flammable gases. It is also forbidden to expose the instrument in environments where dangerous gas concentrations may occur.

Hazard of malfunction

To avoid damages on the instrument, it must be only operated in a controlled electromagnetic environment. According to this, transmitters such as mobile phones must not be operated near to it.
In case of malfunctions and/or service work, please turn off the instrument and contact your local dealer.

1.5 Certification, warranty and documentation

Certification

Viscotech Hispania, S.L. certifies that this instrument has been tested and checked carefully. Its technical data has been verified before shipment to be in accordance with the published specifications. The instrument complies with applicable international safety regulations.

Warranty

This MYR product is warranted against defects in material and workmanship for a period of 2 (two) years. Parts which prove to be defective during the warranty period will be repaired or replaced free of charge. No other warranty is expressed or implied. Unauthorized modification or repair by third party persons will void the warranty. The warranty will expire in case of improper or wrong use of the instrument and in case the warning and precautionary messages are not observed. Viscotech Hispania, S.L. is not liable for any occurring damage.

Once the warranty period has expired, we recommend signing a service contract in order to guarantee the perfect functionality of the instrument. For more information on this subject, please contact your local dealer.

Documentation

This user manual will be delivered together with each instrument. Further copies can be ordered at the local dealer by giving the serial number of the instrument, the number of the user manual and the date of issue.

This user manual is available in the following languages: English and Spanish.

Errors and omissions excepted. Subject to amendment and improvement without further notice.

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2 Technical data

Portable viscometer VP 1000 RM	
Power requirements	**Alkaline batteries 4x AA/LR6**
	Rechargeable batteries 4 x AA/R6
Batteries capacity	**Alkaline: 1.900 mAh**
	Rechargeable: 2.500 mAh
Batteries autonomy	**24-30 hours non-stop use**
Displayed data	▪ **fixed speed (62,5 rpm)** ▪ **selected Rotor (R1-R3)** ▪ **dynamic viscosity (mPas/dPas)** ▪ **full scale range** ▪ **full scale percentage** ▪ **battery level indicator**
Compatibility	**100% compatible with RION VT-04F and HAAKE VT 2 Plus**
Rotor	**Rotors no. 1, 2 and 3**
Speed	**fixed speed at 62,5 rpm**
Viscosity range **(with Rotors no. 1, 2 and 3)**	**<u>Rotor 3</u>: 0,3 - 13 dPas // 30 - 1.300 mPas** **(with measuring vessel /Cup no. 3)** **<u>Rotor 1</u>: 3 - 150 dPas // 300 – 15.000 mPas** **(with measuring vessel /Cup no. 3)** **<u>Rotor 2</u>: 100 -4.000 dPas // 10.000 – 400.000 mPas** **(with measuring vessel /Cup no. 3)**
Measuring Cup	**Measuring vessel/Cup no. 3 (included in basic delivery)**
Accuracy	**± 2% of full scale**
Repeatability	**± 1%**
Measurements	**17 x 11 x 41 cm**
Weight	**1.800 g**

Operating conditions:	**from +10°C until +40°C** **(at a max. rel. humidity of 80% without condensation)** **altitude up to 2000 m M.S.L.** **for indoor use only.**
Pollution degree:	**2**
Protection category:	**IP 20**

3 Setting up the viscometer

3.1 Reception and unpacking of the instrument

Follow these steps after receiving the instrument:

- Please check carefully the packaging box of the viscometer before removing it in order to find out transportation damages.
- Should the packaging box be broken or have suffered any other damage, please contact the shipping agency before opening it.
- Once you have taken the instrument out of the box, check if damages can be observed. Should this be the case, please inform the dealer that has delivered you the equipment.
- Remove all packing straps, protectors and accessories used during transport. Recyclable materials are to be disposed in the containers provided therefore.

3.2 Scope of delivered parts

- Portable rotational viscometer VP 1000 RM
- Set of rotors (Rotor no. 1, Rotor no. 2, Rotor no. 3)

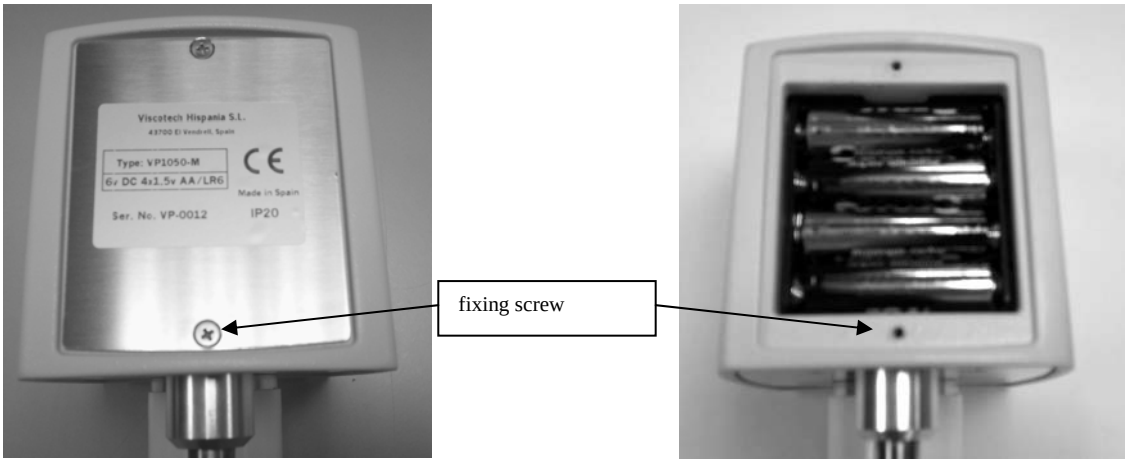
  Material: stainless steel
- Measuring vessel (Cup no. 3). Approx. capacity 170 ml

  Material. DELRIN
- Alkaline additional batteries AA/LR6 (6V)

3.3 Setup

Portable viscometers VP 1000 RM are battery operated. The basic delivery scope comprises 4 alkaline batteries 4xAA/LR6 (6V) installed in the unit and 4 additional batteries for replacement. The unit can work both with alkaline batteries from type AA/LR6 and with rechargeable ones from type AA/R6. In continuous operation, batteries have a lifespan of 24 to 30 hours. Battery level is indicated on the display by means of a symbol.

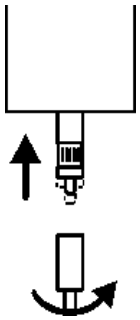
Batteries are positioned at the back side of the viscometer. To replace them, proceed as follows.



- Remove the screws as indicated in the illustration
- Remove the cover plate of the battery housing and replace the batteries. Please pay attention to the correct polarity when doing this operation.
- To replace the cover in its original position, place correctly the cover and tighten the screws again. On the cover plate there is a label with the most relevant data of the viscometer.

3.4 Setting up the Rotor

All Rotors included in the standard delivery must be smoothly immersed into the fluid to avoid bubble formation below the surface.



- To assemble the Rotor, hold firmly the pivot shaft with one hand and screw up the Rotor onto it using the other hand.
- To screw up the Rotor, turn it in the direction shown in the illustration on the left (counter-clockwise).
- Once it has been inserted, submerge the Rotor into a fluid until it reaches the notch that indicates the top immersion level allowed. In doing so, please take care not to hit neither the Rotor nor the pivot shaft with the vessel to avoid distortion of Rotor perpendicularity.
- Rotors included in standard delivery have a thread connection to pivot shaft. Optionally, it is possible to order a coupling between Rotor and pivot shaft so that connection is done through a hook. If this option is preferred, a slight concentric movement of the Rotor during measurement is considered totally normal.

Be very careful when you perform this operation in order to prevent the Rotor from bending or the pivot shaft from suffering damages.

Both the Rotor and the screw must be in perfect conditions and extremely clean.

Rotors are made of stainless steel. Each Rotor carries the reference name engraved on its head.

3.5 Measuring vessel

To avoid that rotation stress might drag measuring vessel/ Cup no. 3 containing sample to be analyzed, viscometer features a very simple anchorage system: three holes in the viscometer base where the fixing pins of the measuring vessel are inserted.

For a better accuracy of viscosity reading, it is advisable to use the measuring vessel /Cup no. 3 included in basic delivery.

If a different container is used, the viscosity resistance applied to the Rotor will be different, leading to deviations in the viscosity results.

! **As the viscometer is not equipped with regulating feet, the surface where the instrument is placed must be perfectly levelled.**

! **The filling mark (170 ml) in measuring vessel/Cup no. 3 must be respected to be able to work with complete set of Rotors (no. 1, 2 and 3).**

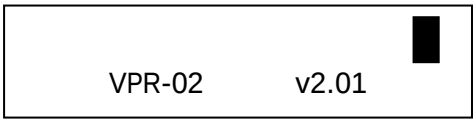
4 Operation

4.1 Initial turn-on and configuration

The configuration of the VP 1000 RM viscometer is very simple. The only parameters that can be modified are the Rotor and the measuring unit. The information on the display can be modified using the ENTER button and the two arrows ▲ (up) and ▼ (down).

Initial turn-on and configuration

Turn on the viscometer by pressing for an extended time (between 6 and 10 seconds) the ENTER button. After that, an introductory display with a symbol of the battery state appears.



Shortly afterwards, you can view the main display with the configuration that was last used with the viscometer.

The display includes the following information: speed (rpm), measurement unit (mPas/dPas), Rotor type (R1, R2,R3) and full scale percentage. The viscometer works always at one speed 62,5 rpm. The only parameters that can be modified are the Rotors and the measurement units (milliPascal seconds (mPas) or deciPascal seconds (dPas)). Should you wish to carry out measurements with a different Rotor as the one that appears on the display, follow these steps to modify it:

- Press shortly any one of the arrows (▲ or ▼).

In doing so, the display will show following information:

- The Rotor reference last used flashes on the display. At the right side, you can see the full scale range corresponding to the combination of selected Rotor and instrument speed.

The full scale range refers to the maximum viscosity reading that the viscometer can achieve with selected combination of speed and Rotor. This value helps the user to select the correct Rotor according to the viscosity of the sample that must be analyzed.

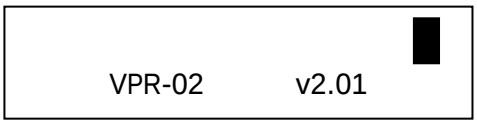
- Use the arrows (▲ or ▼) to set the correct Rotor type between R1 and R3.
- When the correct type appears on the display, press ENTER to validate. After that, the main display appears again with the new modification introduced.

If by any reason you omit to press ENTER during 15 seconds when modifying the Rotor, the viscometer returns automatically to the main display and will accept the last Rotor selected.

It is therefore very important to check that the Rotor that has been set up in the viscometer matches with the one that is being showed on the display.

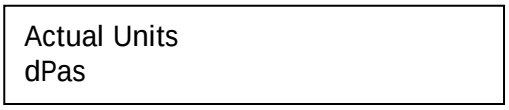
Selecting Measuring Units

Turn on the viscometer by pressing for an extended time (between 6 and 10 seconds) the ENTER button. After that, an introductory display with a symbol of the battery state appears.



Within the period of 2 seconds, press one after the other **UP** and **DOWN** keys. Display will show following:

Press **ENTER** to validate. Screen will show the current mesuring unit being used.



Press **UP** or ▼ keys to select between mPas or dPas. Once selected, press again to validate. Instrument will return automatically to the presentation screen and to the measurement mode showing selected measuring unit.

4.2 Measurement

Preparing sample

Pour sample in the delivered measuring vessel/Cup no. 3 up to the filling mark and attach desired Rotor.

Locate Cup no. 3 onto the base by means of the 3 centring pivots.

If using a different sample container, centre Rotor correctly in sample.

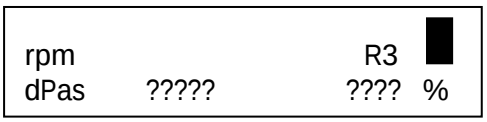
Measurement start

To start the rotation and trigger the measurement,

- press simply ENTER.

The Rotor beginns to rotate and the display delivers following data: speed (62,5 rpm), Rotor reference and question marks meaning that viscometer waits for viscosity reading,

Waiting for viscosity reading



Viscosity readings (in mPas/dPas) and full scale percentage will be displayed afterwards.

If user operates with a different container than the measuring vessel/Cup no. 3 delivered with instrument, it is absolutely necessary to centre Rotor in the sample container before operate.

Overrange

If following display appears during the measurement process, you have exceeded the maximum reading's limit (overrange). In this case, change the Rotor considering full scale of each one. For a correct selection, enter the Rotor selection screen to check FSR for each one .

It is advisable to operate with viscometer in the best measuring range, this is between > 10% and < 90% of full scale range. Nevertheless, viscometer shows viscosity readings within the whole range.

Finish of measurement

To finish the measurement process,

- press ENTER again

to stop the drive. The measurement result along with the full scale percentage will remain on the display.

To start another measurement, proceed as described before.

Turn off the viscometer

- Press the ENTER key for an extended time to turn off the viscometer.
- By doing this, following information appears on the display.

Power Off Shutting Down ...

Don't forget to switch off the instrument (by pressing for a few seconds the ENTER button) when you have finished the measurements. Otherwise, the viscometer will remain active and batteries will run out.

In the event that charge of batteries is not enough to perform accurate measurements, viscometer will inform user and will turn off automatically.

Low Battery Shutting Down

5 About viscometer's calibration

The instrument delivered has been calibrated with standard Newtonian oils by the manufacturer before shipping. We recommend carrying out calibrations on a regular basis according to operation frequency. For the correct calibration of the viscometer, please contact your local dealer.

5.1 Viscometer's verification

We recomend to check the proper functionallity of the viscometer on a regular basis using our Newtonian viscosity standards, available on demand. Viscotech calibration oils are calibrated at two (2) different temperatures (20 and 25°C) and allow a more accurate correlation between temperature and viscosity.

When carrying out the verification of the viscometr, we suggest to work with Rotor no. 3 (if the complete set of Rotors is available) and measuring vessel/ Cup no. 3 . Calibration standard suggested is of 1 000 mPas. Once the viscometer began to rotate and after allowing a mimimum of 5 readings, the value on the display should correspond with the one indicated in the certificate of the standard oil, considering also allowances (viscometer's accuracy + standard accuracy) involved.

Due to the great influence that temperature has on viscosity measurements, we strongly recommend to perform the viscometer's verification test with the oil at the temperature specified in the oil certificate.

5.2 How to perform the "auto zeroing" function

If after turning on the viscometer and initiating the rotation of the Rotor without immersing it in a fluid, the reading on the display does not indicate 'zero', you should proceed as follows:

- Turn on the viscometer by pressing for a few seconds the **ENTER** button. You will enter the presentation screen.
- Within the period of 2 seconds press the **DOWN** arrow ▼ and ENTER consecutively in order to access to the AutoZERO option

After this, following information appears on the display

Options AutoZERO

▪ Press ENTER to enter the following screen

Remove Spindle Press <ENTER>

Don't forget that the "AutoZERO" option must be carried out without Rotor and with the viscometer placed on a levelled surface.

- Press ENTER to start the “AutoZERO” process which will allow you to modify the "zero" value. During this process, following message appears on the display.

AutoZERO wait....

- When the process has successfully finished, the display will automatically return to the presentation screen and to the measurement mode.

6 Accessories (optional)

Battery charger R6 AA/Ni-Cd/Ni-Mh
Rechargeable batteries
Rotor rack
Special coupling for hook spindles
Newtonian certified calibration oils (600 ml)

7 About viscosity

7.1 Description

Myr viscometer VP 1000RM are rotational and portable viscometers to determine the viscosity of a wide range of fluids.

The principle applied by this viscometer is equivalent to that of the rotational viscometers: a Rotor turning at a constant speed is immersed in the sample (fluid) to be analyzed. The resistance to Rotor movement caused by the viscosity of fluid being analyzed is displayed directly in mPas/dPas.

Depending on the viscosity, the resistance exerted by a fluid opposing the motion of a Rotor varies depending on the size of the Rotor. The viscometer has been calibrated to deliver readings in mPas/dPas, according to speed and Rotor type used.

7.2 Related concepts

Viscosity

Viscosity is a distinctive property of the fluids. It is the measure of internal friction of a fluid when a layer of this fluid is forced to move in relation to another layer. Viscosity is a value highly dependant on temperature.

The standard units for dynamic viscosity measurements are mPa.s (S.I) or cP (C.G.S).

1mPas (miliPascal second)=1cP (centiPoise)

1 dPas (deciPascal second)= 100 mPas

1dPas=1P (Poise)

Laminar flow

It is the ideal movement between layers without transfer of mass from one to the other. It is the base to calculate dynamic viscosity.

Turbulent flow:

There is a certain speed from which a transfer of mass between layers occurs. Result is an apparently greater shear stress and an erroneously high viscosity reading. Turbulent flow is characterized by a sudden and notorious increase in viscosity above a certain speed.

Newtonian fluids:

Viscosity in Newtonian fluids at a given temperature, remain constant regardless of viscometer model, spindle and speed being used. The most common Newtonian fluids are water and thin motor oils.

Non-Newtonian fluids: This kind of fluids does not show a lineal relation between shear stress and shear rate. Different working conditions have as a result different viscosity values.

Apparent viscosity is defined as the result of a fluid analysis. This result can be reproduced in another viscometer only if analysis is carried out maintaining identical working conditions and following a defined working process. Variables below influence results:

- Viscometer model
- Dimensions of sample container
- Filling level
- Sample temperature
- Rotor
- Rotating speed
- Duration of test (time dependant fluids)

Generally speaking each modification in the working method and working process will indefectibly lead to variations in final analysis results. There are different behaviors within the non-Newtonian fluids:

Pseudoplastic: Samples whose viscosity decreases when increasing shear rate. It is also called “shearthinning” flow behavior. Most common pseudoplastic fluids are coatings, milk, ink and jam.

Plastic: Under static conditions they might have a similar behavior to a solid. For a correct evaluation of the fluid it is necessary to reach the “yield value” to make fluid flow so that product later shows any of the possible material characterizations: Newtonian, pseudoplastic or dilatant.

Examples: toothpaste, chocolate, grease.

Dilatant: Viscosity of dilatant fluids increases when shear rate increases. It is also called “shearthickening” flow behaviour.

Examples: solutions of sugar and water and mixtures of sand and water.

Time dependent fluids Viscosity of dilatant fluids increases when shear rate increases. It is also called “shearthickening” flow behaviour.

Thixotropic Those fluids in which viscosity and shear stress decrease, maintaining a constant shear rate, with time.

Ketchup, honey, anti-drop paints, mayonnaise .

Rheopeptic Those fluids in which viscosity and shear stress increase, maintaining a constant shear rate, with time.

Lubricants and some paints types are rheopeptic fluids.

Reference substances and viscosities

Substance	**Approx viscosity. (mPas)**
Motor oil SAE 10	65
Olive oil	84
Coatings (airbrushed)	100
Yogourt	150
Sugar solution 70%	400
Lubricating oil	50 – 1.000
Concentrated juice	1.500
Inks	550 – 2.200
Honey	10.000
Nanocellulose (common additive)	8.000 – 10.000
Toothpaste	100.000

8 Viscosity table

The viscosity scale readings for the different Rotors overlap partially. Depending mainly on the properties of the sample fluid, viscosity readings obtained with different Rotors can be also different.

To evaluate correctly results, it is necessary to note down Rotor number and viscosity result obtained.
Viscometer VP1000 R has 3 measuring ranges depending on the Rotor used. The viscosity values stated (both dPas or mPas) are only valid when the measuring vessel/ cup no. 3 is used with the Rotors

ROTOR	Measuring range (dPas)	Measuring range (mPas)	Measuring Cup/Vessel	Sample capacity
R3	0,3 – 13 dPas	30 – 1.300 mPas	Cup no. 3	± 170 ml
R1	3 – 150 dPas	300 – 15.000 mPas	Cup no. 3	± 170 ml
R2	100 – 4.000 dPas	10.000 – 400.000 mPas	Cup no. 3	± 170 ml

9 Problems and solutions

Problem	Solution
The viscometer does not work	• Check the battery level.
The instrument does no read 'zero' without fluids	• Carry out the “AutoZERO” function.
Viscosity speed is unstable and inaccurate	• Perform a calibration check using calibration standards.
	• Check if the Rotor rotates steadily.
	• Check if the sample temperature is stable.
	• Check the rheological features of the sample that must be analyzed.